Journal of Women and Minorities in Science and Engineering 17(1), 1–3 (2011)

PREFACE: ACCOMPLISHMENTS AND CHALLENGES FOR A DIVERSITY OF WOMEN IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS EDUCATION AND OCCUPATIONS

Two critical forces are shaping the future of science, technology, engineering, and mathematics (STEM) in the United States. One is the accelerating need for a scientifically and technologically competent workforce (National Science Board, 2003). Reflecting this labor market demand, the STEM occupations growth expected between the years 2004 and 2014 is 22%—almost double that of all other occupations (Commission on Professionals in Science and Technology, 2006; Terrell, 2007). Computer specialists and engineers will account for the largest share of this growth (Bureau of Labor Statistics, 2009a; Carnevale, Smith, & Strohl, 2010). The national demand for STEM workers already exceeds the national supply of STEM-trained individuals.

The second critical force is the increasing diversity of individuals in higher education and in the workforce. For instance, college enrollment and labor market participation of women and ethnic minorities have dramatically increased over the last three decades (National Center for Education Statistics, 2009). More than 59% of women were in the labor force in 2008 (Bureau of Labor Statistics, 2009b). At the same time, women and some ethnic minorities (i.e., African-Americans, Latinas/os, and Native Americans) are not evenly distributed across fields of studies and occupations. STEM education and careers stand out for their limited diversity, specifically for the underrepresentation of women and some ethnic minorities.

Women's withdrawal from STEM fields appears to start in college. Although as many girls as boys leave high school prepared for STEM studies, in the first year of college women are less likely than men to indicate an intention to major in STEM disciplines [National Science Foundation (NSF), 2009]. By graduation, women are a minority in almost every STEM field. In some STEM disciplines, including engineering, women represent less than 20% of college graduates. Women's participation in STEM declines further at the graduate level, and again at the transition to the workplace [American Association of University Women (AAUW), 2010]. At the same time, patterns of female STEM interest and persistence vary depending on ethnicity. For example, African-American women demonstrate persistent interest and involvement in science and are more likely to be employed in science eight years after high school than European American women (Hanson, 2004; Hanson & Palmer-Johnson, 2000). However, the number of African-American women in STEM occupations is very low, comprising about 3% of the more than 18 million scientists and engineers employed in 2006 (NSF, 2009).

Women in their diversity represent a large untapped talent for STEM education and occupations. The participation of a diversity of women in STEM would bring innovation and creativity to these fields. "With a more diverse workforce, scientific and technological products, services, and solutions are likely to be better designed and more likely to represent all users," according to the 2010 AAUW report on women in STEM. Women

ISSN 1072-8325/11/$35.00

would also benefit from being in STEM occupations. The concentration of women in high-skill but low-pay occupations is what accounts for the majority of the wage gap between women and men. All major STEM occupations have median earnings that are above the national average (Terrell, 2007). While women earn less than men even in STEM fields, women in STEM occupations tend to earn more than women in non-STEM occupations (AAUW, 2010). By contributing to greater pay equity for women, the participation of a diversity of women in STEM is thus also an issue of social justice.

This special issue focuses on the accomplishments and challenges for a diversity of women in STEM education and occupations. Our main goal for this special issue is to expand dominant conceptual frameworks about women in STEM education and occupations. Much research for women in STEM has focused on the undergraduate experience. Thus, in this special issue, we venture beyond the undergraduate college years. Articles in this special issue focus on women in STEM graduate studies (Bernstein, 2011; Hosoi & Canetto, 2011) and women in STEM occupations (Fouad, Fitzpatrick, & Liu, 2011; Paquin & Fassinger, 2011), as well as women who left STEM occupations (Fouad et al., 2011). The articles bring attention to the diversity of women who participate or could participate in STEM. The articles also feature varied research methodologies aimed at capturing women's common and unique experiences.

Women's participation in STEM fields is important to realizing the full talent pool of individuals who can and wish to contribute to science and engineering—rather than science and engineering becoming the domain of an elite few (Zerhouni, 2007). We hope that this special issue advances the science of STEM education and occupational studies, and stimulates new ideas for the design of STEM programs for a diversity of women.

ACKNOWLEDGEMENTS

Angela Byars-Winston is supported in part by grants R01 GM094573, R01 GM088477, DP4 GM96822, and 1KL2 RR025012 from the National Institutes of Health. Silvia Sara Canetto is supported in part by the National Science Foundation Center for Multi-Scale Modeling of Atmospheric Processes (D. Randall, P.I., S. S. Canetto et al., Co-P.I.s), managed by Colorado State University under cooperative agreement No. ATM-0425247 OSP No. 533045. The research they conducted for this article and the views expressed here do not indicate endorsement by the funders.

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